

SELF-RELIANCE AND SUSTAINABILITY OF NUCLEAR ANALYTICAL LABORATORIES IN SMALL STATES OF CENTRAL EUROPE

The Slovenian case

M. KORUN
"Jožef Stefan" Institute,
Ljubljana,
Slovenia
matjaz.korun@ijs.si

1. INTRODUCTION

The Jožef Stefan Institute is the largest research institution in Slovenia devoted to research in many fields of science and technology. Within the Institute several nuclear analytical laboratories operate, making it the largest nuclear research institution in Slovenia. The Laboratory for Radiation Measuring Systems and Radioactivity Measurements belongs to the Department for Medium and Low Energy Physics, which is engaged mainly in nuclear physics, interactions of radiation with matter and its applications, and in providing a service in radiation measurements and dosimetry. The laboratory was founded almost thirty years ago, when the three accelerators, which formed the basis of the research infrastructure of the department, came to the end of their working lives. The personnel took the opportunity to participate in the programme of radioactivity monitoring of the Krško Nuclear Power Plant, which at that time went into operation. The equipment, i.e., the detectors, electronics and computers, was available, but the expertise was limited to the techniques of measurement and analysis in gamma-ray spectrometry. The absence of the expertise in radiochemistry was a serious drawback, therefore new methods in detector calibration had to be developed. In the following years the laboratory participated not only in the monitoring programme of the nuclear power plant but also in other radioactivity monitoring programmes in Slovenia. Since its foundation the laboratory did not receive any financial support either from the state or from the department. Support in equipment and expertise was received from the International Atomic Energy Agency, the Government of the United States and the United Nations Development Programme.

The laboratory is engaged mainly in gamma-ray spectrometric measurements of samples from the natural, living and working environments. The main customers are the Krško Nuclear Power Plant and governmental organizations and agencies. The work for these customers is performed under contracts lasting at least one year. The main customer is the nuclear power plant, which accounts for about 80% of the income.

The Laboratory is not the only provider of services in gamma-ray spectrometry either within the Institute, or in Slovenia. Therefore it is exposed to the pressures of the competitive market, but also to pressures originating from informal ties between the users and other providers of the monitoring service. It should be observed that in a small country the influence of such ties is more important relative to the influence of the market than in larger countries, where the size of the market provides more opportunity for substitution or acquisition of new customers. The large share of one customer in its income makes the Laboratory extremely vulnerable. It should be observed as well that Slovenia has become a member of the European Union and therefore its market is open to competitors from abroad.

2. THE MARKET IN SLOVENIA

The monitoring of radioactive contamination in the environment is carried out mainly according to prescribed monitoring programmes. The financing of general monitoring is

provided by the Ministry of Health and the Ministry of Environment, Spatial Planning and Energy. Site specific monitoring programmes refer to facilities that are permitted to emit radioactive substances to the environment. The size of the programme is related to the expected activities released and the influences of the emissions on the population and environment. Besides the nuclear power plant, the uranium mine in closure, the Reactor Centre managed by the Jožef Stefan Institute and the Central Interim Storage for Low and Intermediate Level Waste managed by the Radwaste Management Agency operate site-specific monitoring programmes. The costs of all programmes together amount to approximately 900 000 € annually but the sum is likely to drop below 700 000 € in the near future.

All programmes have to be approved by the regulatory bodies. The statutory regulatory bodies, for radioactivity are the Slovenian Nuclear Safety Administration and the Slovenian Radiation Safety Administration. Besides approving, the regulatory bodies report yearly on the monitoring results to the National Assembly. As a consequence, the end users of the results of the monitoring programs, beside the operators of the facilities, are also the regulatory bodies. It is therefore in their interest to maintain a high quality of the programmes. On the other hand, the operators are free to choose the provider of the monitoring service, as long as the provider complies with the specifications of the programme.

Besides monitoring programmes the possibilities to use gamma-ray spectrometric measurements for other purposes are small. These are mainly related to food control and small contracts with the regulatory bodies, aimed at specific radiological or radioecological projects. At the time being there are two providers of gamma ray spectrometric measurements in Slovenia which are accredited, one a public research institute and the second a private company. It was the policy of the large customers to maintain two providers of the monitoring service in order to prevent monopolistic behaviour. After joining the European Union, this policy is likely to change, exposing the providers from Slovenia to competition from providers from other member states.

However, the possibility of losing both Slovenian providers would leave the regulatory bodies and also operators of nuclear installations without expertise at hand in many fields of radiation measurement, especially the expertise needed in event of an emergency. It is therefore not in their interest to lose both providers, but they may sacrifice one in order to keep the prices as low as possible.

3. THE PROTECTIVE MECHANISMS

As was shown, the Slovenian market for gamma-ray spectrometric measurements is small and divided between two providers of the service. The capacities of the personnel and the equipment are therefore not fully engaged which incurs additional costs to the service. Both providers are therefore vulnerable to competition, especially to low price offers from other member states of the EU.

To protect local expertise connected with the provision of environmental monitoring services, the regulatory bodies are inclined to set up protective barriers in order to prevent low-price competitors from abroad successfully tendering for their offers. The kinds of barriers they are prepared to set up promote the quality of the expertise they expect from the providers of the monitoring service. They are therefore inclined to set high standards for the quality of the service. On the other hand, the providers accept the quality imposed in order to decrease their vulnerability.

It should be observed that this process mimics the situation which occurs in service to industry. In contrast to the measurements performed for industry, where the demand for quality is high, the quality in control measurements, such as measurements performed within prescribed monitoring programmes, is defined in the legislation. The motivation for requesting a high quality of service in the legislation on one hand and preparedness to offer or even surpass the requested quality on the other hand introduces a working regime similar to that in industry. Here a kind of synergy can be identified resulting in a high quality of the service and better sustainability of the providers of the service.

National nuclear research institutions are capable of meeting the high standards because of their expertise in research in the nuclear field and their traditions. Because of their broad capabilities, as compared to private companies, the regulatory bodies regard them as natural partners in managing the technical aspects of radiation monitoring such as checks of equipment of the providers of the service, assessment of the quality of their systems, design of the system of control measurements, assessment of the quality of results, advising in case of changes of legislation, etc. Their main drawback with respect to private companies is their smaller possibility to influence the costs, but here their corresponding advantage is their smaller motivation to make a profit, because they are not free in allocating it.

The protective mechanisms are a set of criteria, which the providers can fulfill but on the low-price competitors they are posing additional costs, therefore they must increase their prices. The barriers, set up to reduce the pressure of competitors from abroad, can be structured in analogy to the main virtues which the customers prize when evaluating suppliers of goods: price, quality, delivery time, service. All requirements for these properties, except the price, can be incorporated in some kind of regulation. The quality can be described by the minimum detectable activities for radionuclides, which are rarely detected, relative uncertainties for radionuclides which are often detected, by prescribing minimal technical requirements for the equipment, requiring participation in proficiency tests, prescribing minimal success in these tests, etc. Because the requirements characterizing the conditions of reporting, which represents the delivery, may comprise the form and content of the reports due to reporting uncertainties and dose estimates, there is an additional requirement to report the activities of all radionuclides recorded in the spectra with conditions when special reports must be submitted, e.g., in the case of increased concentrations or detection of new radionuclides. In the case of monitoring the service represents the ability of the provider to assist the customer in the case of unforeseen events or to support him in performing other tasks related to monitoring of radioactivity. Requests regarding service can be expressed in terms of the number of measurements which the provider must be able to perform in addition to the contracted measurements, the competence of the personnel, etc.

The criteria, used by regulatory bodies for evaluation of the providers, increase the efficiency of the protection. By requesting fulfillment of high criteria for the quality of monitoring, reporting and the ability to service other needs of the customer, the protection of one provider is not absolute, since other providers may be able to fulfill the criteria. Therefore the providers, or the institutions where they reside, must undertake actions on its own to decrease their vulnerability.

4. THE NATIONAL NUCLEAR INSTITUTES

Traditionally, national nuclear institutions are research oriented. They may maintain close contacts with universities to participate in the education process. The environment is academic and therefore important criteria for promotion of personnel are related to the number of publications, mentorship of graduate and postgraduate students and other measures

of excellence in research. Personnel may be not motivated to engage in activities where the main burden of work lies in performing routine tasks such as sampling, sample preparation and measurements. Also the management of national nuclear research institutions may be in doubt whether these activities belong to an organization which is primarily devoted to research.

Since it is not expected that the national nuclear institutes will adapt the criteria for evaluation of the nuclear analytical laboratories the described situation poses an additional pressure on the laboratories providing services related to monitoring of radioactivity. To demonstrate their compatibility with the environment in which reside, their activities must result in achievements, which the academic sphere prizes. One possibility is to keep the quality of their work at a level which enables its publication. As the result, not only the recognition of their peers is attained, but also the vulnerability is smaller since the quality of the service and the reputation of the laboratory are improved.

In order to demonstrate the compatibility of the engagement of the Laboratory for Radiological Measuring Systems and Radioactivity Measurements with that of the Institute, it was decided not to rely on standard methods in gamma-ray spectrometry during the process of acquiring accreditation according to the ISO 17025 standard, but to develop original methods. As the result, the scientific output of the laboratory was extremely high when compared with other laboratories of similar size within the Institute on the basis of bibliographic criteria. In addition to that, a broad scope of accreditation was achieved, namely measurements the activity of any gamma or X ray emitters in homogeneous cylindrical samples of any homogeneous material.

Similar to the scientific and technical performance, the business performance can be improved as well. But here it has to be taken into account that the education of the personnel in national nuclear institutes is mainly technical therefore it may not possess the necessary knowledge and skills. It can be observed that the ISO 17025 standard requests some elements of good business practice to be implemented. To expand the knowledge the laboratory management already acquired during the accreditation process in a broader framework and to increase their competence, education and training of the laboratory management may often be necessary. The corresponding courses should build on the requirements of the ISO 17025 and ISO 9001 standards, since these represent the basis of the existing knowledge of laboratory management. Here the International Atomic Energy Agency could provide the necessary opportunities for acquisition of relevant knowledge.

Other actions aimed at reducing the vulnerability of nuclear analytical laboratories require deeper adaptation of the organization of the national nuclear institutes. Reducing the price, for instance, is difficult for public organizations since they lack many possibilities to reduce the costs of the service.

5. CONCLUSION

National nuclear institutes are often research oriented public organizations with extensive expertise in radiation measurements, dosimetry and metrology of ionizing radiation. In small countries a large part of the national capabilities, which can provide the service and expertise in the fields of use of radioactivity and ionizing radiation, resides in such national nuclear institutes. Therefore they represent a valuable asset for the regulatory bodies which are authorized for radioactivity and ionizing radiation. These bodies are in charge to assure the compliance of the practice with the requirements in the legislation. As a consequence, the regulatory bodies are prepared to support the aims of national nuclear institutes to maintain

their capabilities and to increase the quality of the service and the expertise related to the use of radioactivity and ionizing radiation. The national nuclear institutes, on the other hand, must be able to promote the quality of service and to offer their capabilities to the regulatory bodies and other external users under conditions which are compatible with that of the free market. In this way the nuclear analytical laboratories, which are part of the national nuclear institutes and are engaged in providing the service and expertise, can achieve and maintain self-reliance and sustainability.